

REMARKS

The Examiner has objected to claims 225, 228 and 236 for certain informalities. The wording "*said predetermined number times*" and "*substantially*" is deleted from the claims. Claim 236 is changed to *recite "a wavelength"* rather than "*the wavelength*". Applicants submit that the amendments overcome the objections, which are not made for reason of patentability.

The Examiner rejects claims 224-242 as being obvious under 35 U.S.C. § 103(a) from a combination of references starting from US 5,822,438 (Sekine et al) and utilizing the teaching of JP 05-199598 ("Kazuhide"). Applicants respectfully traverse this rejection.

The present independent claims, 224 and 232, relate to a method and apparatus which cause plural input signals representing respective channels to appear to emanate from different positions in space. The patent specification describes a "DPAA" device that comprises a plurality of output transducers. The input signals are delayed and summed so as to direct the sound waves of the channel towards the position in space for that channel. In other words, directed sound beams are produced for each channel using sum and delay circuitry. When the sound beams reach the surfaces, they are reflected towards the listener so as to create a surround-sound effect.

Sekine et al discloses apparatus for simulating a virtual source. The system of Sekine et al is thus most similar to the fourth embodiment of the first aspect shown on Figure 16D of the present application. The present claims are not directed to the "virtual source" embodiment. Rather, the present claims are primarily directed towards the embodiment shown in Figure 21.

Figure 1B of Sekine is a representative example where two physical left and right speakers SB(L) and SB(R) are used to simulate four virtual speakers, VS10 - VS 13. This is achieved by a combination of delaying and summing the eight input channels. The Sekine device does not "direct, using said array of output transducers, soundwaves of each channel towards the respective position in space" as recited in the claims. The "respective position in space" in the Sekine device is that point where the channels appear to emanate from, Sekine transmits sound from the physical loudspeakers directly to the listener, but delays various signals so that the sounds are perceived to come from points other than the physical loudspeakers. This is different from "directing" sound towards a reflective surface.

The Examiner has acknowledged that Sekine does not disclose any reflective or resonant surfaces. The Examiner puts forward the opinion that the skilled person would be taught the use of reflective surfaces from Kazuhide and would use them in connection with the invention of Sekine.

Kazuhide discloses a very simple construction in which a first channel is emanated using a first single loudspeaker. An omnidirectional sound field is achieved as shown in drawing 2 of Kazuhide. In other words, the loudspeaker 31

radiates the first channel equally in all directions and thus does not “direct” ... “using said array of output transducers, soundwaves of each channel towards the respective position in space”. The loudspeakers 32, 33 are driven in antiphase so as to create “null” at the directly in-front position. This is shown in drawing 3. Aside from at the directly in-front position, the sound from loudspeakers 32, 33 is broadly transmitted in all directions, as will be apparent from drawing 3.

Thus, Kazuhide does not cure the deficiencies of Sekine because Kazuhide does not “direct, using the array of output transducers, soundwaves of each channel towards the respective position in space”. Rather, Kazuhide discloses omnidirectional loudspeakers which transmit sound in all directions for both channels, with the exception of the second channel which is not transmitted in one narrow direction only. This is different from specifically directing sound of a respective channel towards a respective reflective device as taught by the present invention.

It is interesting to contemplate what sort of system would result if one placed reflective surfaces at the “respective positions” in the Sekine device. Such “respective positions” would be those positions where the sound channels appear to emanate from. Thus, the (hypothetical) reflective surfaces would be placed at the positions of the virtual speakers VS 10 - VS 13 shown in Figure 1B of Sekine

However, as the virtual origin effect in Figure 1B is created due to the direct transmission of sound from the left and right physical speakers to the listener, placing reflective surfaces at the positions of the virtual speakers would seem to have no effect on this direct transmission of sound. If anything, the reflective surfaces would serve to reflect unwanted rearwardly moving sound from the loudspeakers back to the listener, potentially destroying the whole effect. Thus, if the worker were to hypothetically to combine the Kazuhide reflective surface with the Sekine device, the results would be undesirable. That would be sufficient to demonstrate that the two references, if combined, would not lead to the subject matter recited in the present claims.

However, if we take the hypothetical analysis a step further, we surmise that upon discovering the problem described above, a person with ordinary skill in the subject matter might try to move the reflective surfaces. However, as Sekine is a “virtual origin” device, there is no position of reflective surfaces which would achieve the correct effect. Instead, to get the results taught by the invention recited in the present claims, a person would have to fundamentally change the control logic and transform the Sekine device from a “virtual origin” device to a “sound beaming” device. There is no teaching, suggestion or motivation in the prior art to do this. Kazuhide does not disclose a “sound beam” device but rather a device that produces a simple null in a second channel in one particular direction.

So, even looking at both pieces of prior art together, there is no teaching that delay and sum circuits be used to create sound beams which can be directed towards respective reflective surfaces so as to create a surround-sound effect. Sekine discloses simulating origin using delay and sum circuits, but this type of

system is completely incompatible with reflective surfaces. Kazuhide discloses using reflective surfaces to reflect sound, but does not disclose creating any sound beams, let alone using delay and sum circuits. Nothing in either or both of the references teaches or suggests to the skilled person that sound beams be created using delay and sum circuits

Applicants reiterate that Kazuhide does not provide any teaching which tells the person of ordinary skill in the art where to put the reflective surfaces in the Sekine device. Moreover, because the Sekine device is a “virtual origin” device, there isn’t actually any position where the reflective surfaces would do any meaningful job.

As the dependent claims contain all of the limitations of the independent claims, they are allowable for at least the same reasons.

Applicants acknowledge the Examiner’s citation of the Eberbach and Yanagawa et al U.S. patents and submit that neither adversely affects the patentability of the present claims.

CONCLUSION

Applicants submit that the present amendment, in view of the foregoing Remarks, place the case in condition for allowance. A prompt review and Notice of Allowance are earnestly solicited. If the Examiner has any questions, he is invited to phone Applicants’ attorney at the phone number given below.

Respectfully submitted:

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